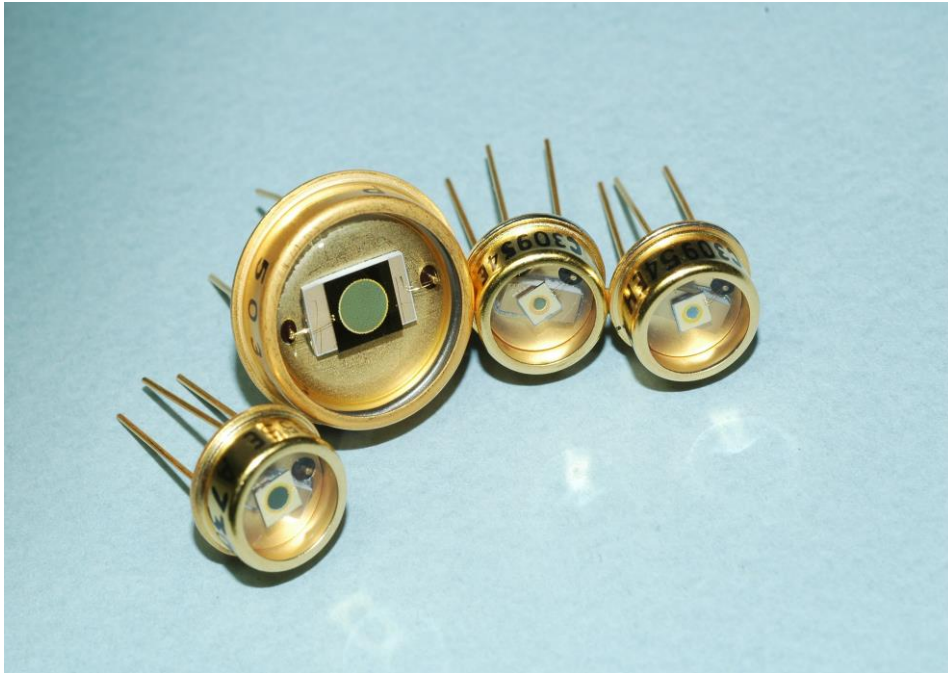


## **C30954EH, C30955EH and C30956EH Series**

### **Long Wavelength Enhanced Silicon Avalanche Photodiodes**



*Reach through 1064nm quantum efficiency enhanced silicon avalanche photodiode.*

#### **Key Features**

- High Quantum Efficiency at 1060nm
- Fast Response Time
- Wide operating Temperature Range
- Hermetically sealed packages

#### **Applications**

- Range finding
- LIDAR
- YAG Laser Detection

Excelitas' C30954EH, C30955EH, and C30956EH are general purpose silicon avalanche photodiodes made using a double-diffused "reach through" structure. The design of these photodiodes is such that their long wave response (i.e. > 900 nm) has been enhanced without introducing any undesirable properties.

These APDs have quantum efficiency of up to 40% at 1060 nm. At the same time, the diodes retain the low noise, low capacitance, and fast rise and fall times characteristics.

Standard versions of these APDs are available in hermetically-sealed, flat top glass TO-5 packages for the smaller area C30954EH and C30955EH, and a TO-8 package for the larger area C30956EH.

To help simplify many design needs, these Si APDs are also available in Excelitas' high-performance hybrid preamplifier module, C30659 Series, as well as the preamplifier and Thermo-electric (TE) cooler incorporated module, the LLAM Series.

Recognizing that different applications have different performance requirements, Excelitas offers a wide range of customization options for these APDs to meet your design challenges. TE cooler-packaged versions are available on a custom basis. Operating and breakdown voltage selection, dark current and NEP screening, custom device testing and packaging are among the many application-specific solutions available.

## Long Wavelength Enhanced Silicon Avalanche Photodiode

**Table 1 – Mechanical and Optical Characteristics**

Parameter	Symbol	C30954EH	C30955EH	C30956EH	Unit
Shape		Circular	Circular	Circular	
Package		TO-5	TO-5	TO-8	
Photosensitive Surface:					
Useful area	A	0.5	1.77	7	mm <sup>2</sup>
Useful diameter	d	0.8	1.5	3	mm
Field of View:					
Nominal field of view $\alpha$ (see Figure 10)	FoV	110	104	135	Degrees
Nominal field of view $\alpha'$ (see Figure 10)		125	130	150	

**Table 2 – Electro-Optical Characteristics**

 Case Temperature  $T_A = 22\text{ }^\circ\text{C}$ ; at the DC reverse operating voltage  $V, V_{op}$ <sup>1</sup>

Parameter	Symbol	C30954EH			C30955EH			C30956EH			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
Breakdown Voltage	$V_{br}$	300	375	475	315	390	490	325	400	500	V
Temperature Coefficient of $V_{op}$ for Constant M	$V_{op}$		2.4			2.4			2.4		V/ $^\circ\text{C}$
Gain	M		120			100			75		
Responsivity at 900 nm at 1060 nm at 1150 nm	R	65 30 4	75 36 5		55 26 4	70 34 5		36 20 2.8	45 25 3.5		A/W
Quantum Efficiency at 900 nm at 1060 nm at 1150 nm	Q.E.		85 36 5			85 40 5			85 40 5		%
Total Dark Current	$I_d$		50	100		100	200		100	200	nA
Noise Current $f=10\text{kHz}, \Delta f=1.0\text{Hz}$	$i_n$		1	2		1	2		1.1	2.2	pA/ $\sqrt{\text{Hz}}$
Capacitance	$C_d$		2	4		3	5		10	12	pF
Series resistance	$R_s$			15			15			15	$\Omega$
Rise/Fall Time, $R_L = 50\Omega$ :											
10% to 90% points	$t_r$		2	3		2	3.5		2	3.5	ns
90% to 10% points	$t_f$		2	3		2	3.5		2	3.5	

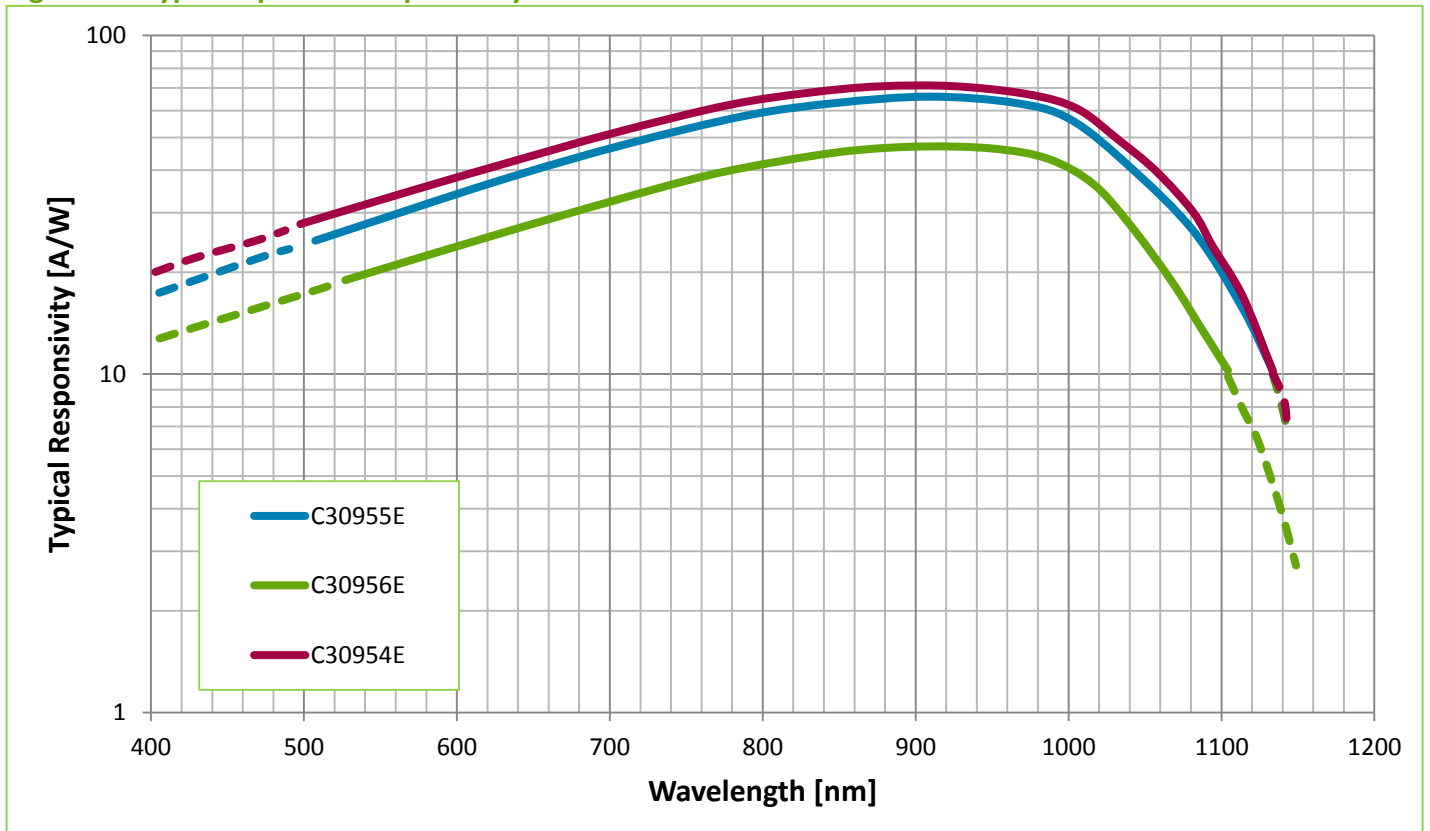
<sup>1</sup> A specific value of  $V_R$  is supplied with each device. When the photodiode is operated at this voltage, the device will meet the electrical characteristic limits shown above. The voltage value will be within the range of 275 to 450 volts.

## Long Wavelength Enhanced Silicon Avalanche Photodiode

**Table 3 – Absolute – Maximum Ratings, Limiting Values**

Parameter	Symbol	Minimum	Typical	Maximum	Unit	Remarks/Conditions
Reverse Bias Current				200	μA	
Photocurrent Density : average value peak value	$J_p$			5 20	mA/mm <sup>2</sup>	Continuous operation
Forward Current: average value peak value	$I_F$			5 50	mA	Continuous operation (For 1 second duration, non-repetitive)
Storage Temperature	$T_{stg}$	-60		100	°C	
Operating Temperature	$T_o$	-40		70	°C	
Soldering				260	°C	5 seconds, leads only

**Figure 1 – Typical Spectral Responsivity Characteristics**



## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 2 – Typical Responsivity at 900 nm as a function of Operating Voltage,  $V_{op}$  (C30954EH)

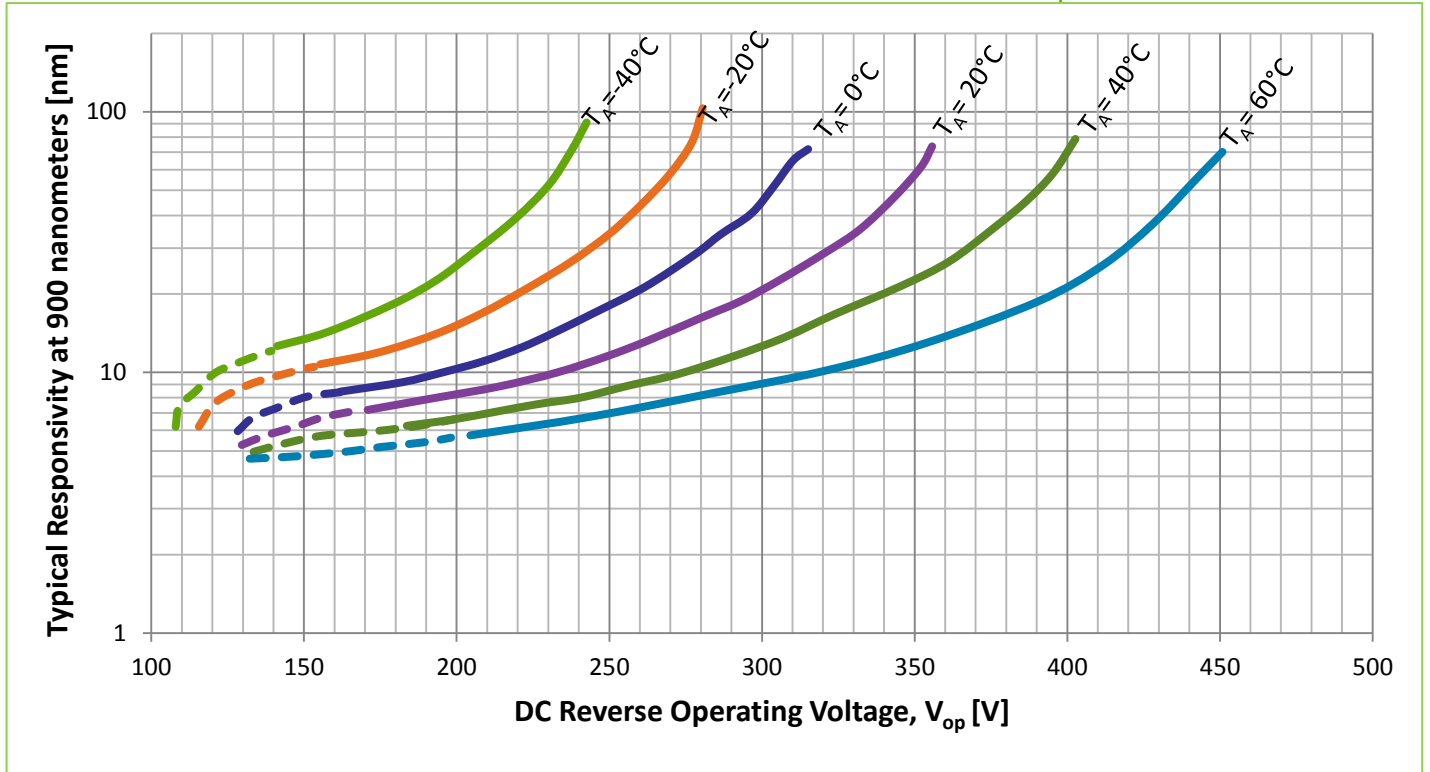
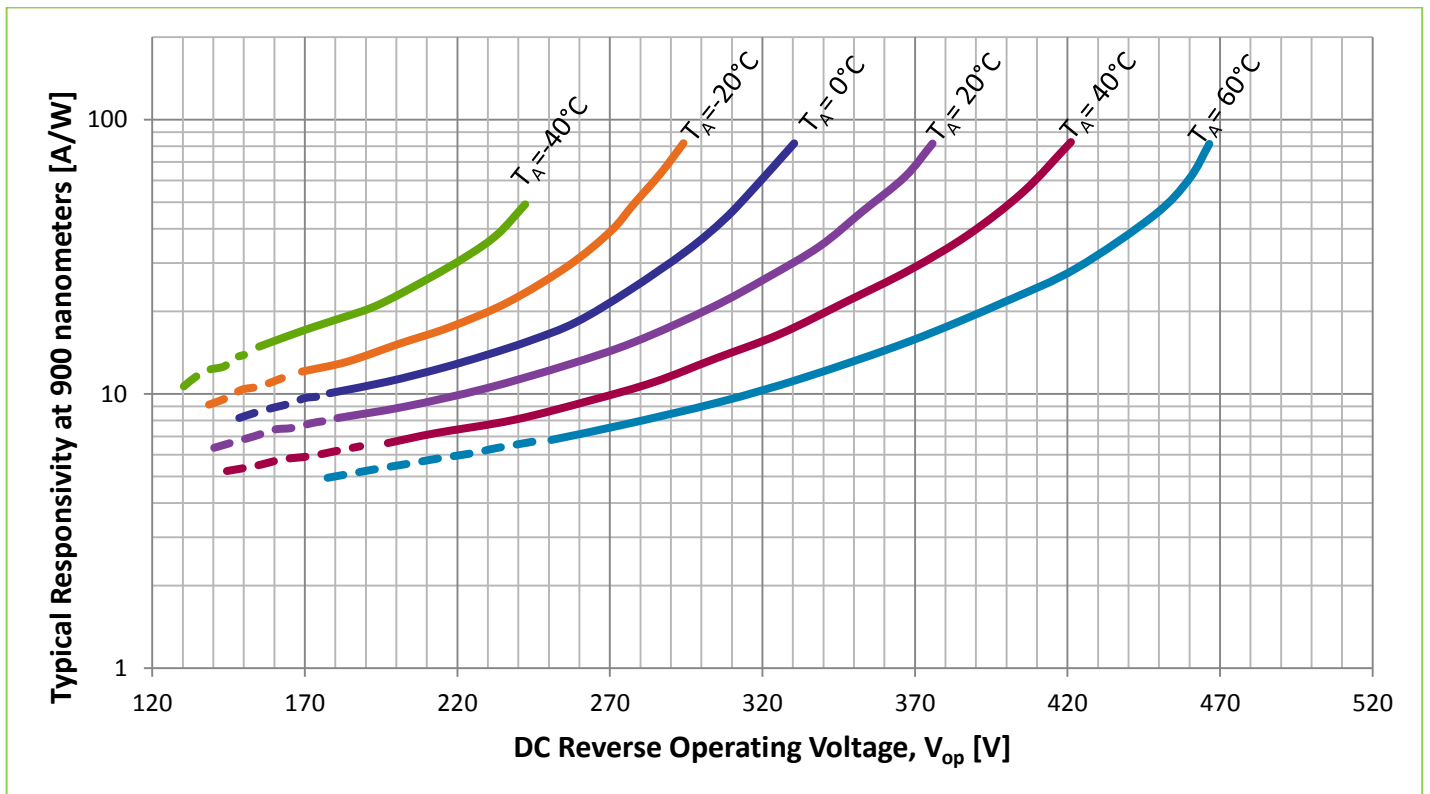


Figure 3 – Typical Responsivity at 900 nm as a function of Operating Voltage,  $V_{op}$  (C30955EH)



## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 4 – Typical Responsivity at 900 nm as a function of Operating Voltage,  $V_{op}$  (C30956EH)

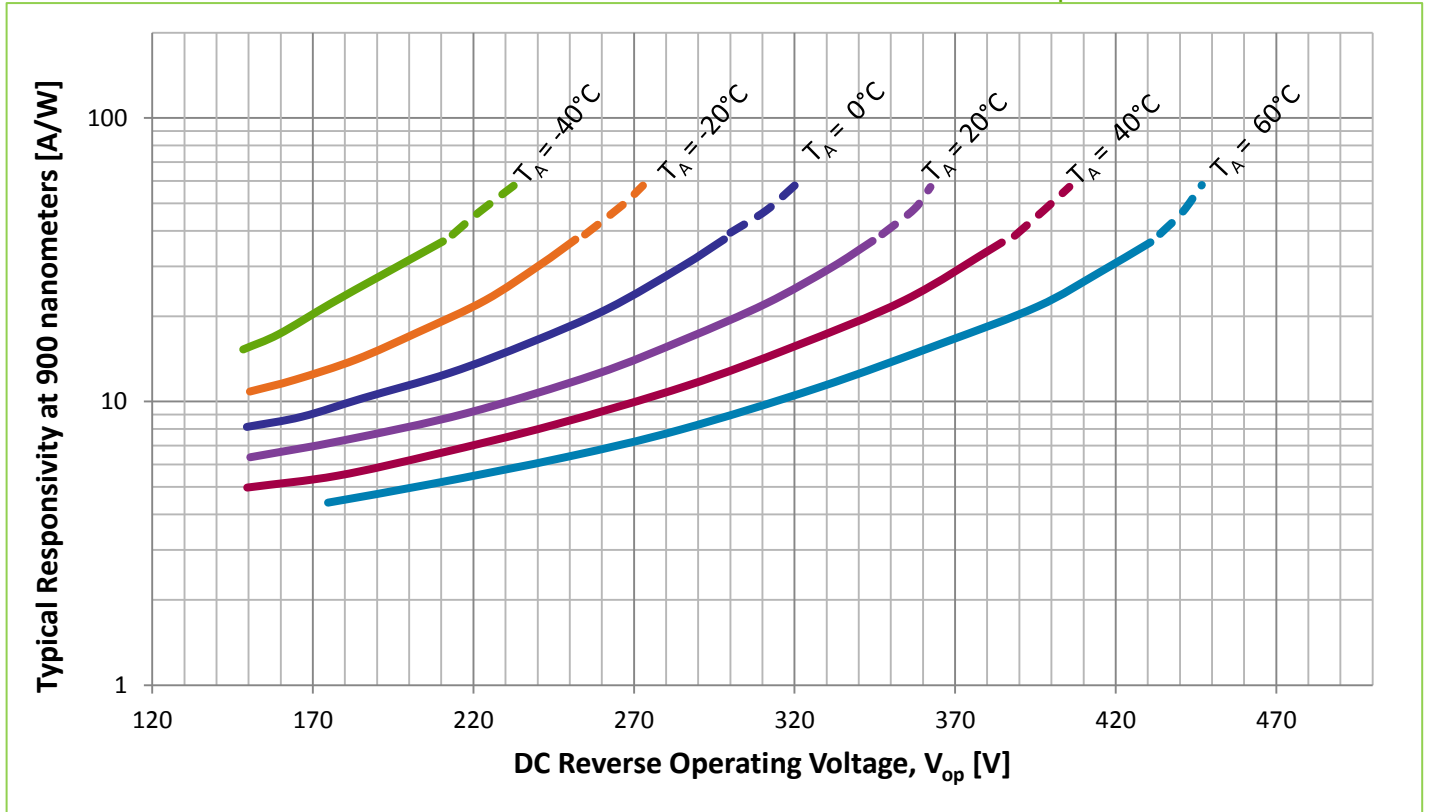
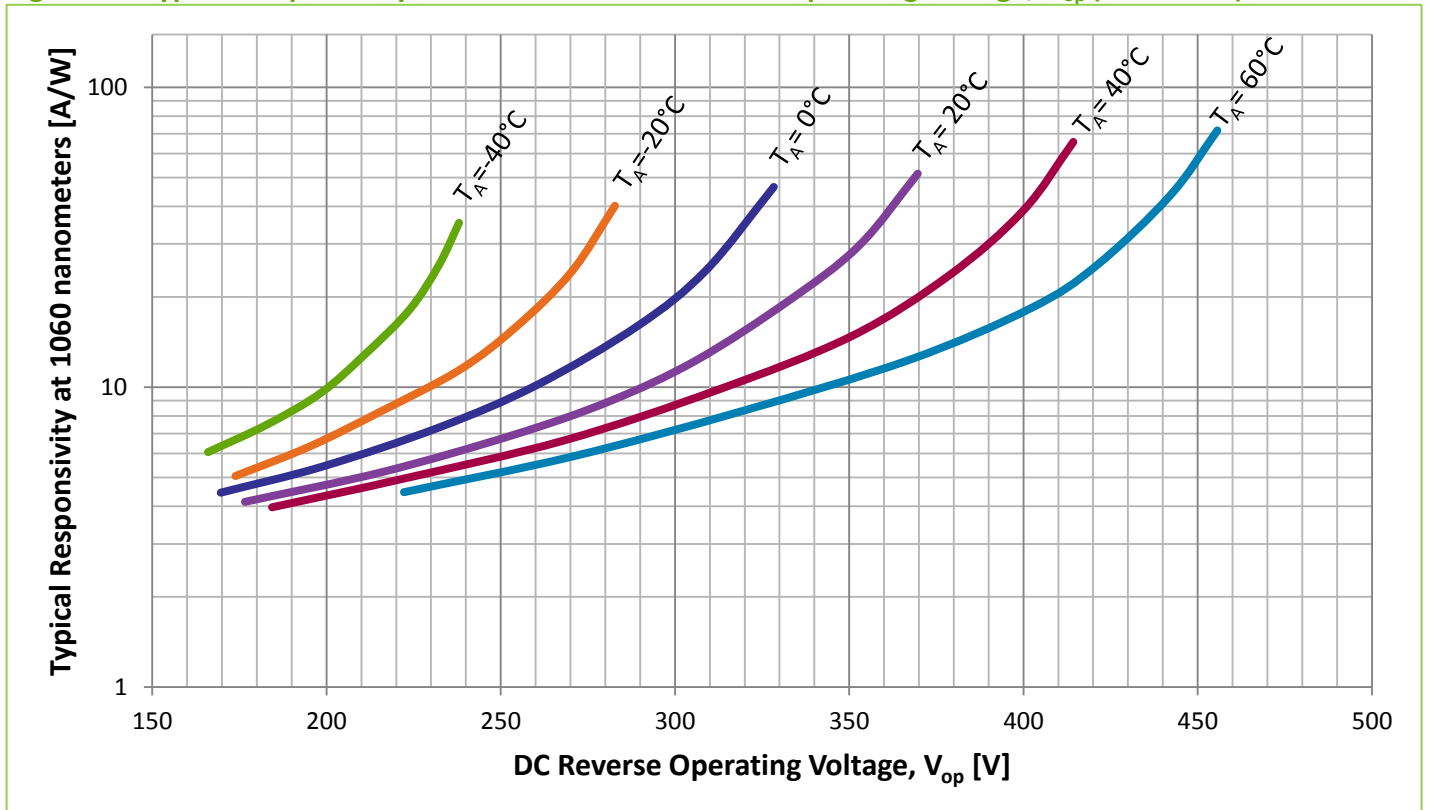


Figure 5 – Typical Responsivity at 1060 nm as a function of Operating Voltage,  $V_{op}$  (C30954EH)



## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 6 – Typical Responsivity at 1060 nm as a function of Operating Voltage,  $V_{op}$  (C30955EH)

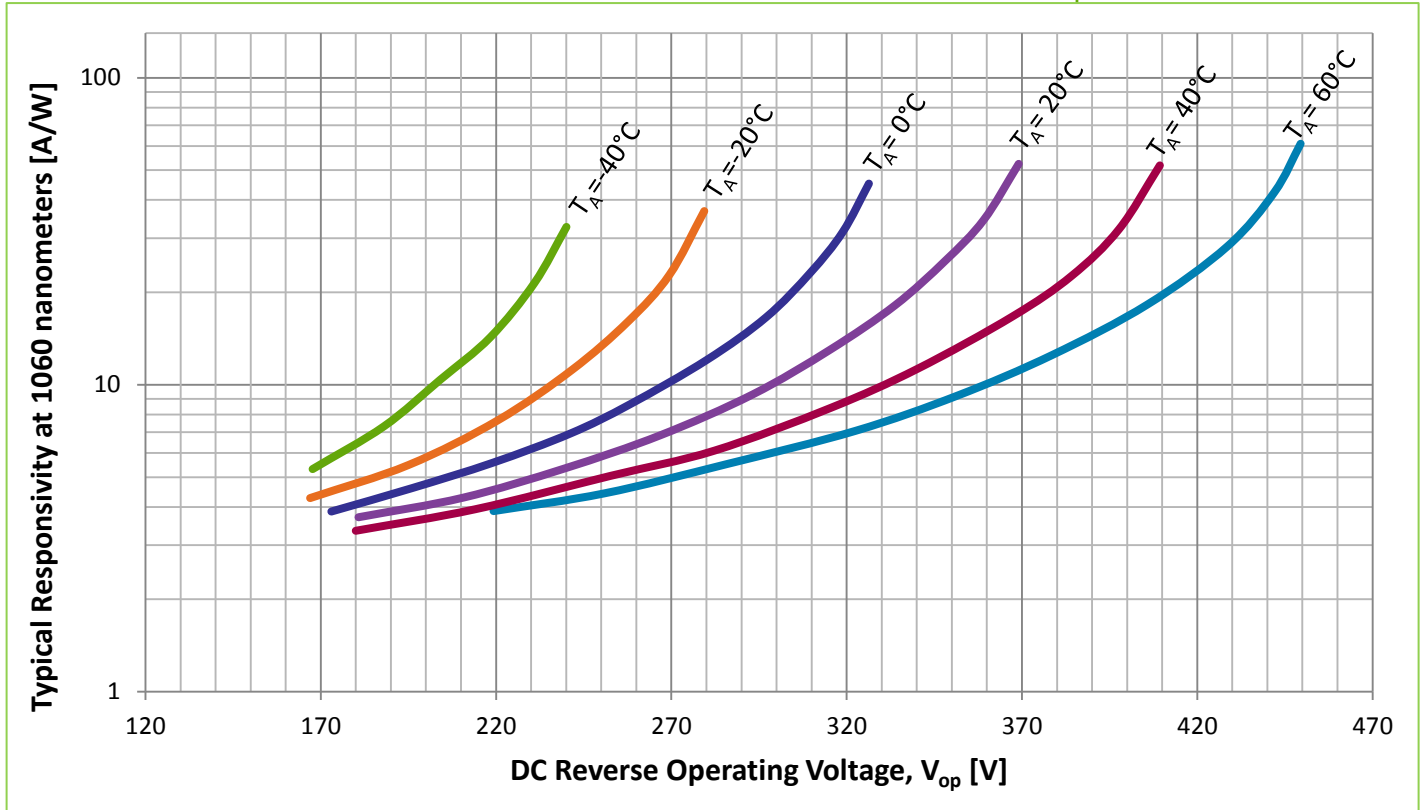
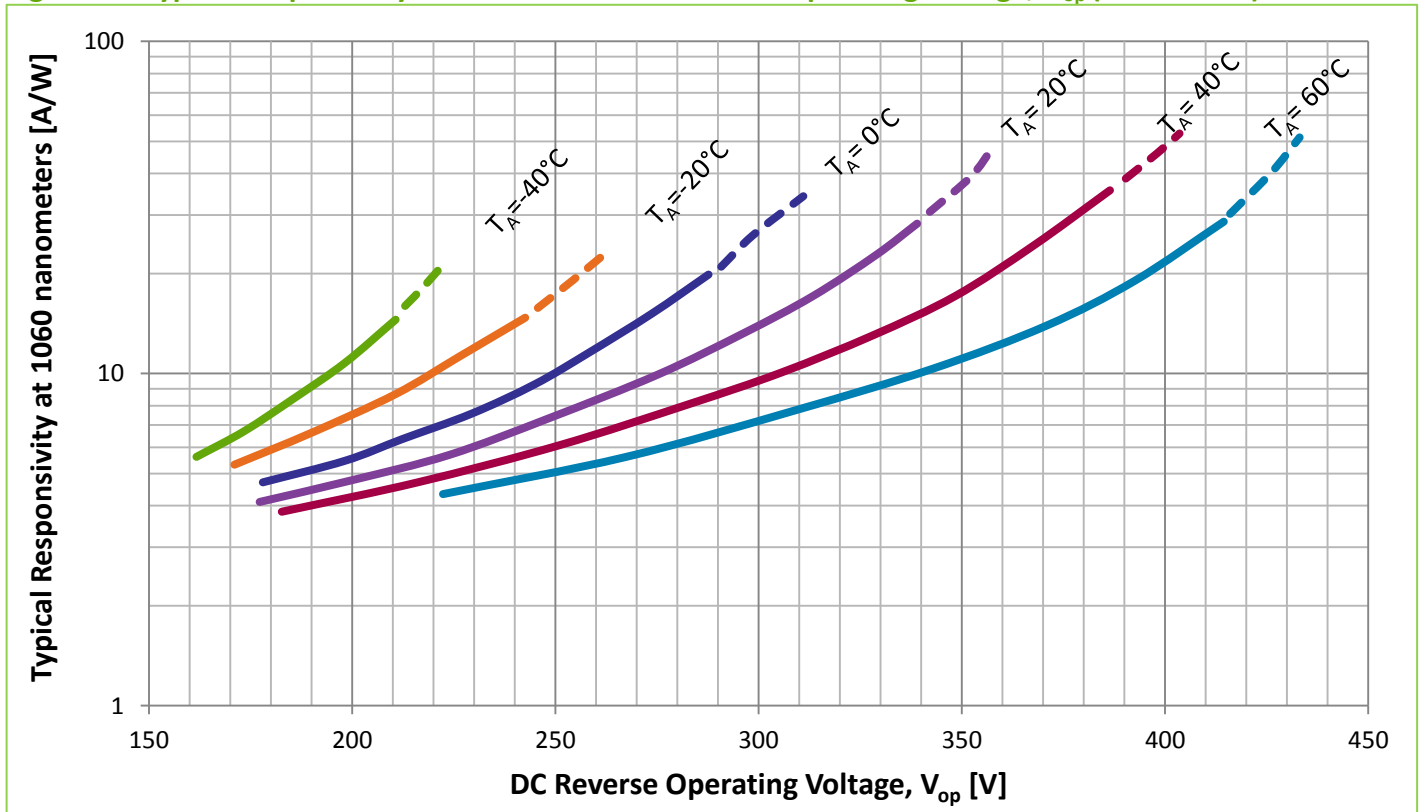


Figure 7 – Typical Responsivity at 1060 nm as a function of Operating Voltage,  $V_{op}$  (C309556EH)



## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 8 – Typical Dark Current as a function of Operating Voltage,  $V_{op}$

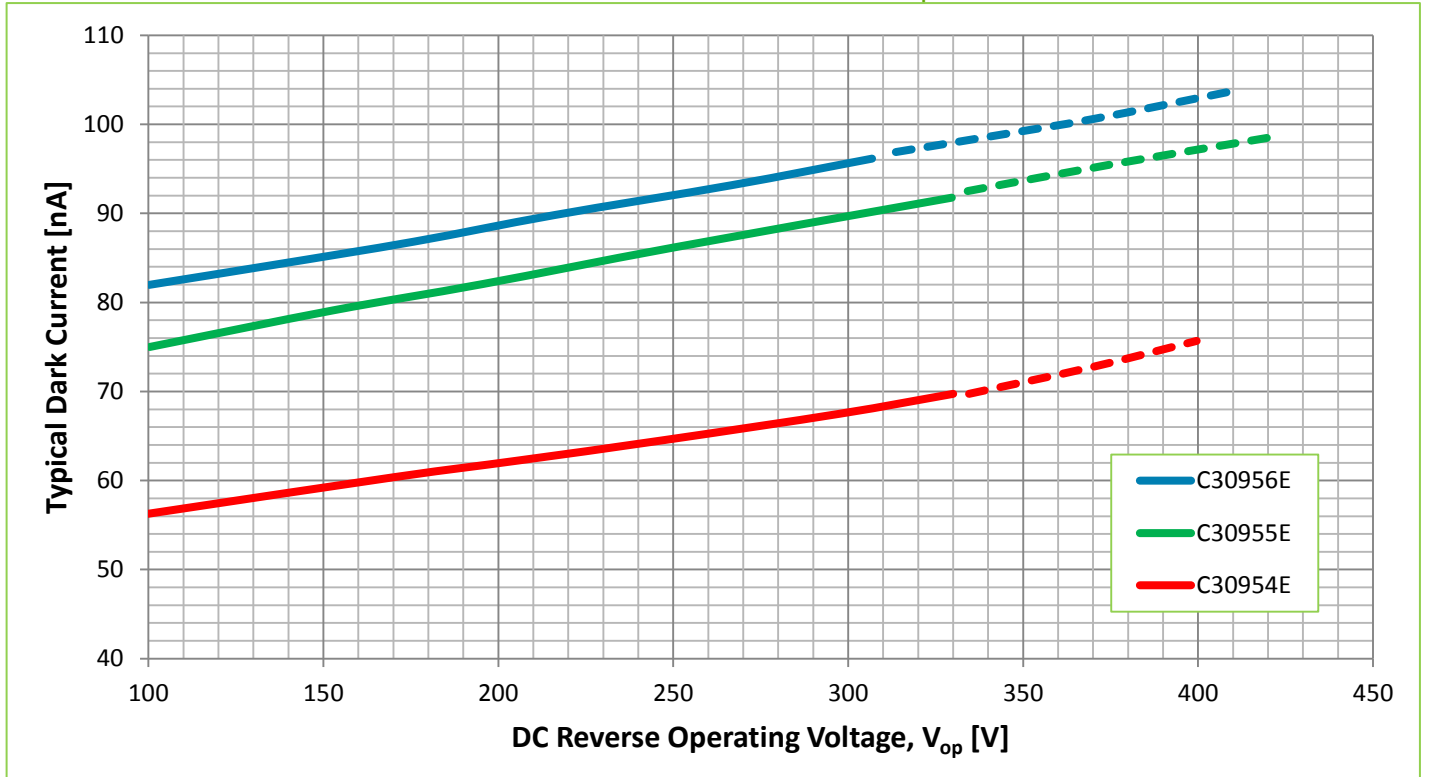
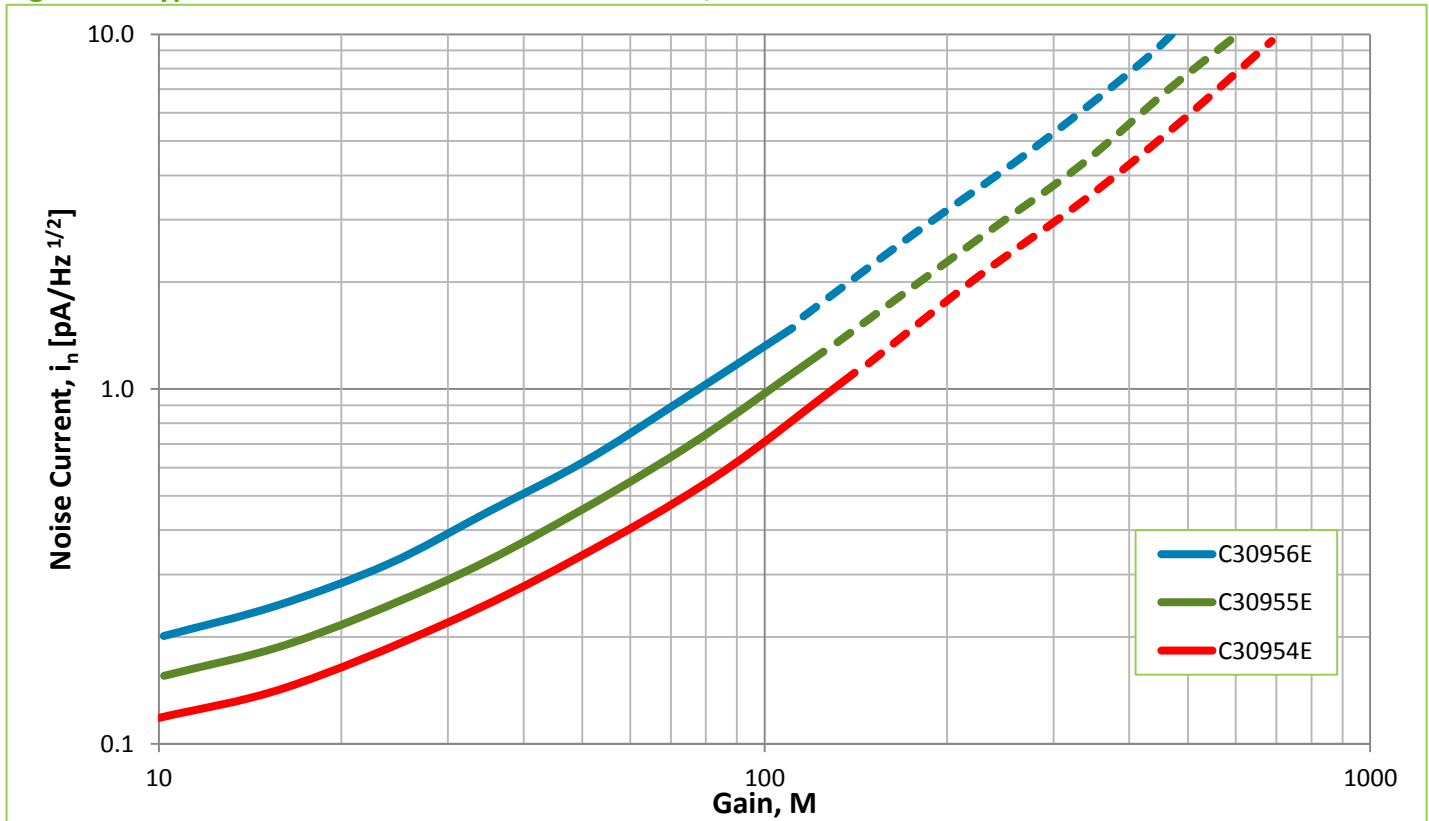


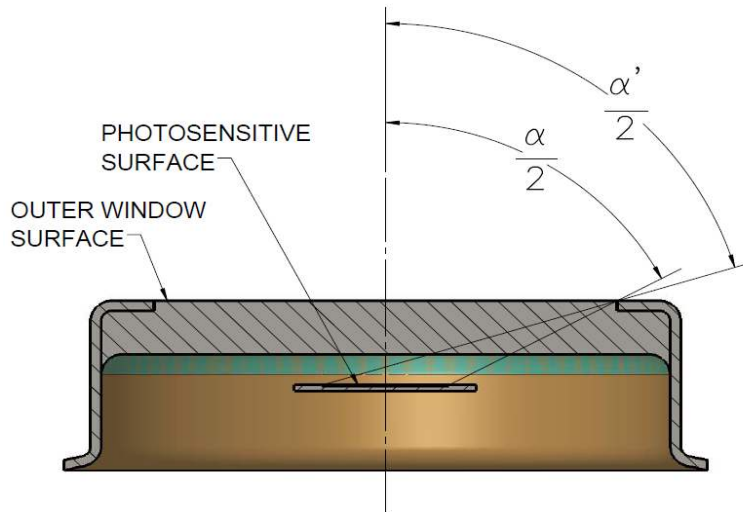
Figure 9 – Typical Noise Current as a function of Gain,  $M$



## Long Wavelength Enhanced Silicon Avalanche Photodiode

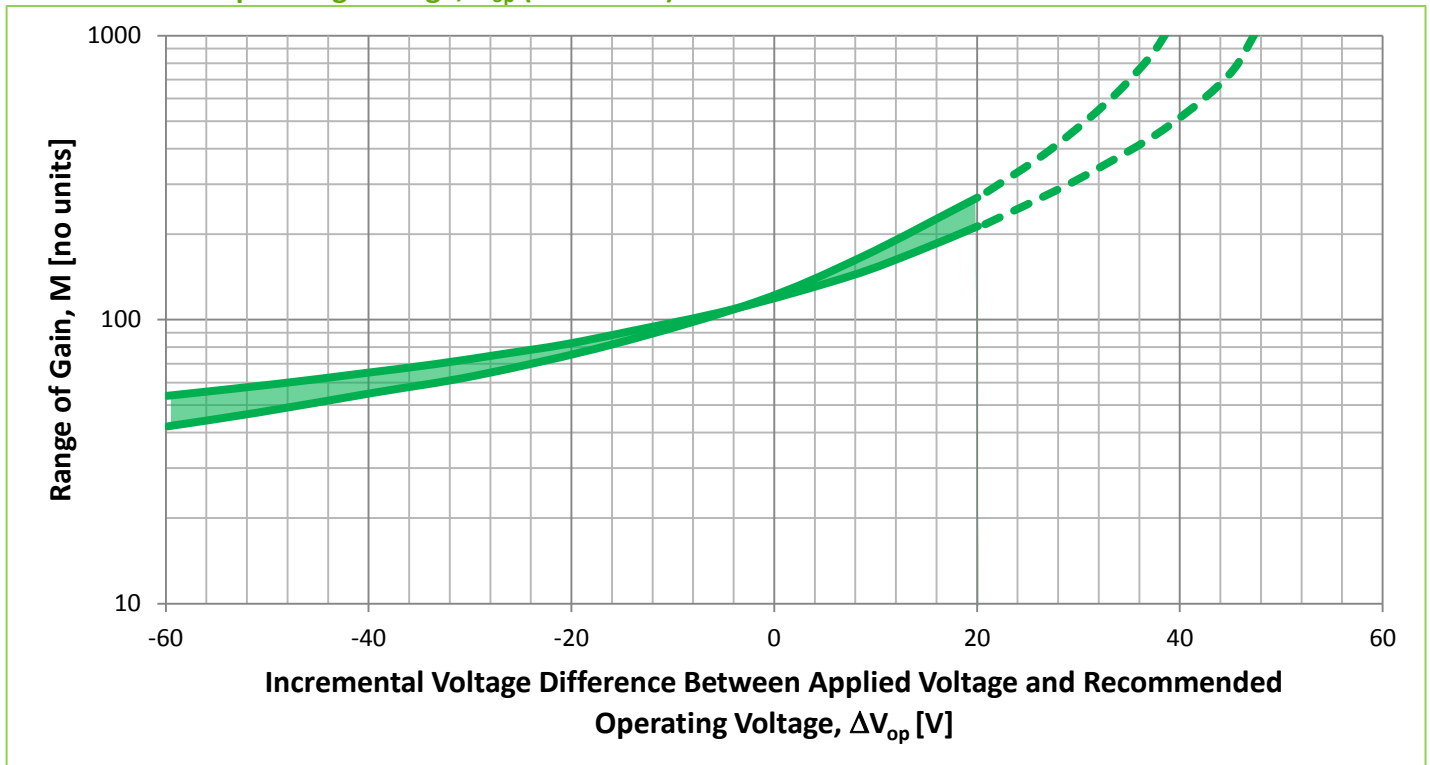
Figure 10 – Approximate Field of View

For incident radiation at angles  $\leq \alpha/2$ , the photosensitive surface is totally illuminated.  
 For incident radiation at angles  $> \alpha/2$ , but  $\leq \alpha'/2$ , the photosensitive surface is partially illuminated



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Figure 11 – Variation of Gain as a function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage,  $V_{op}$  (C30954EH)





## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 12 – Variation of Gain as a function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage,  $V_{op}$  (C30955EH)

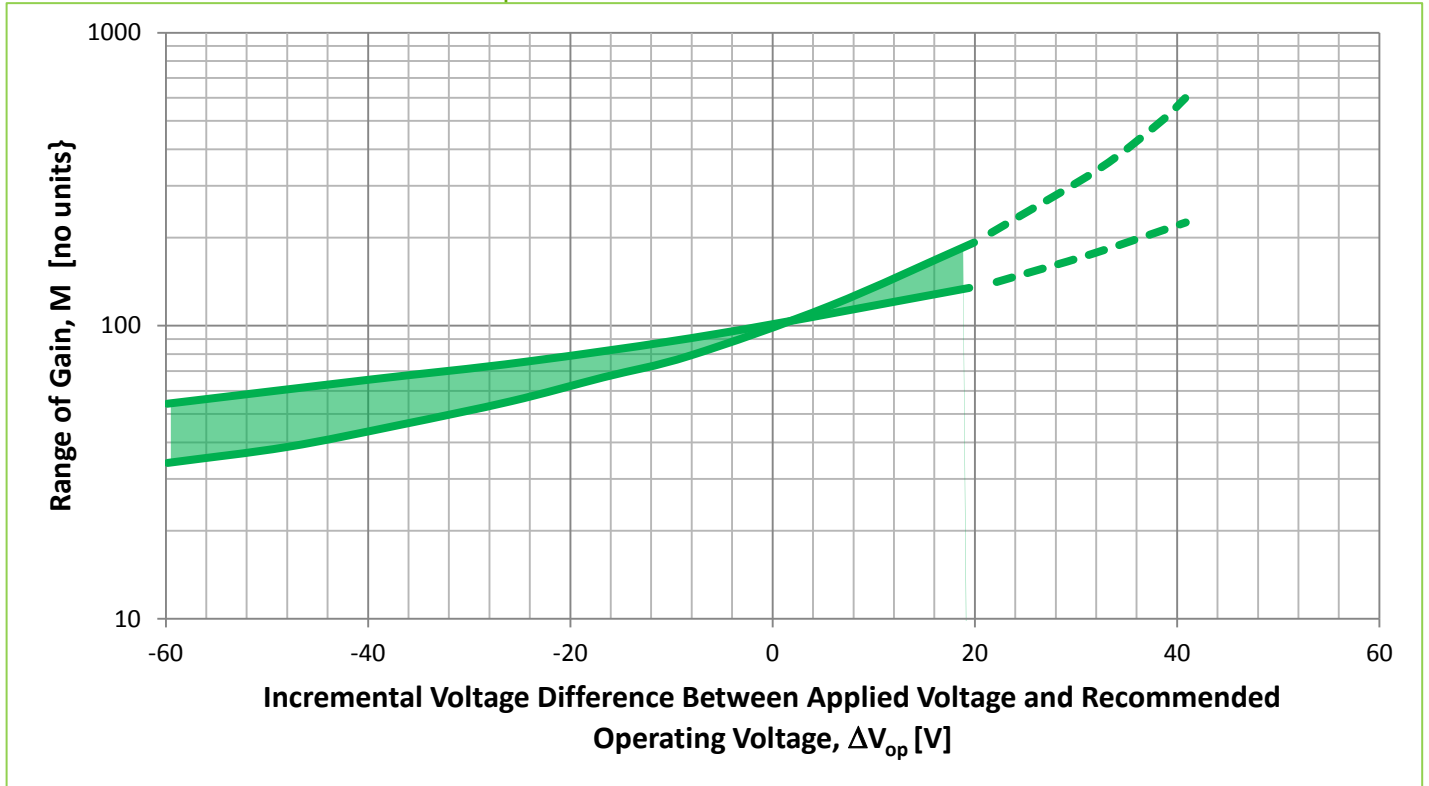
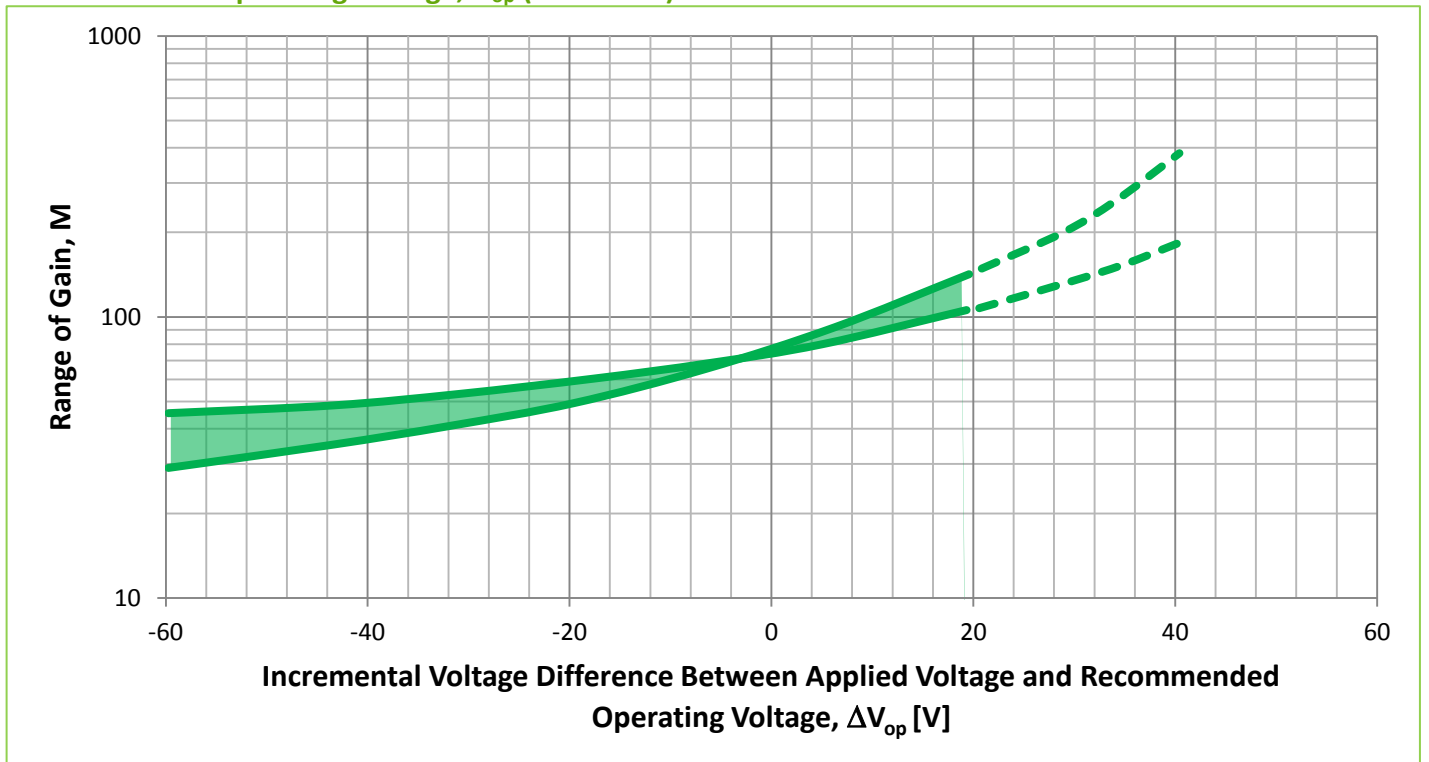


Figure 13 – Variation of Gain as a function of Difference between Actual Applied Operating Voltage and Recommended Operating Voltage,  $V_{op}$  (C30956EH)



## Long Wavelength Enhanced Silicon Avalanche Photodiode

Figure 14 – Dimensional Outline (C30954EH, C30955EH Types) Low-Profile TO-5 Package, dimensions in mm (inch)

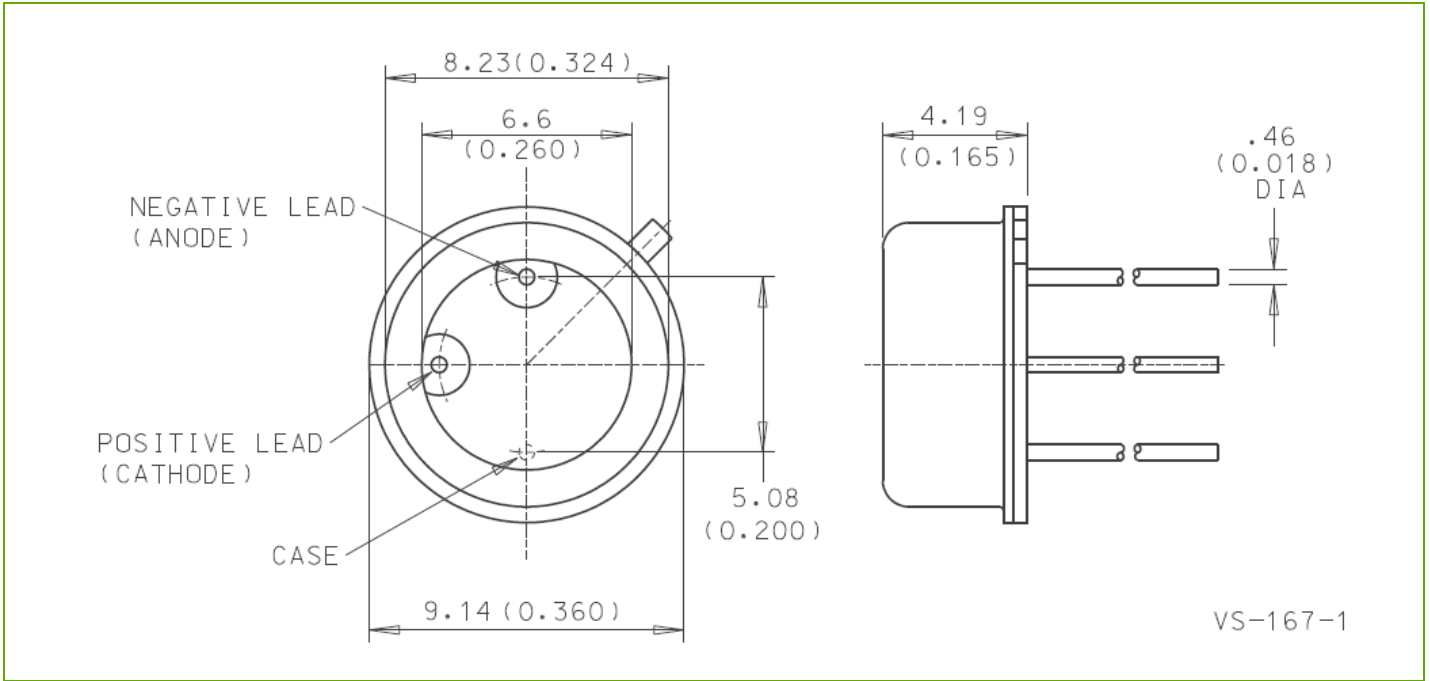
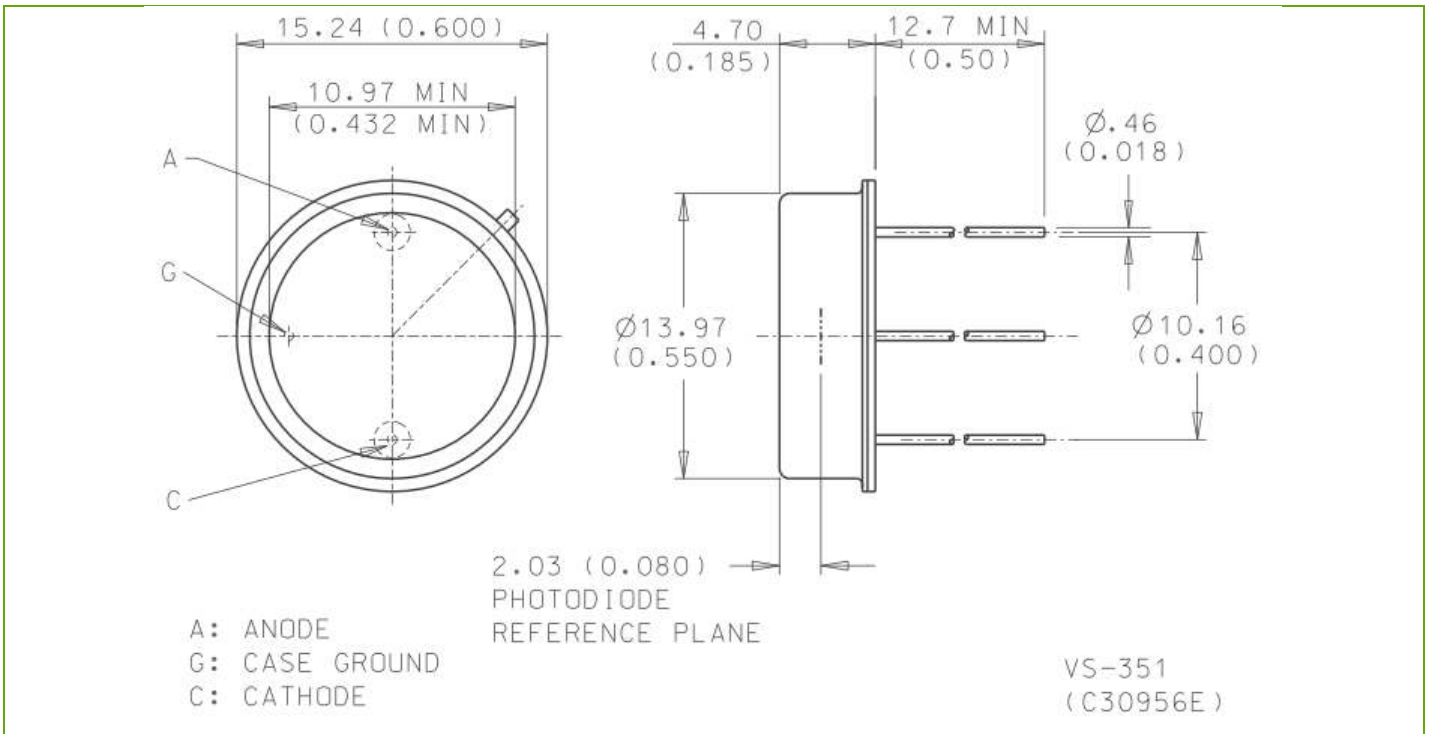


Figure 15 – Dimensional Outline (C30956EH Types) Low-Profile TO-5 Package, dimensions in mm (inch)



## Long Wavelength Enhanced Silicon Avalanche Photodiode

### RoHS Compliance

The C30954EH, C30955EH and C30956EH Avalanche photodiodes are designed and built to be fully compliant with the European Union Directive 2011/65/EU – Restriction of the use of certain Hazardous Substances (RoHS) in Electrical and Electronic equipment.



### Warranty

A standard 12-month warranty following shipment applies. Any warranty is null and void if the photodiode window has been opened.

### About Excelitas Technologies

Excelitas Technologies is a global technology leader focused on delivering innovative, customized solutions to meet the lighting, detection and other high-performance technology needs of OEM customers.

Excelitas has a long and rich history of serving our OEM customer base with optoelectronic sensors and modules for more than 45 years beginning with PerkinElmer, EG&G, and RCA. The constant throughout has been our innovation and commitment to delivering the highest quality solutions to our customers worldwide.

From analytical instrumentation to clinical diagnostics, medical, industrial, safety and security, and aerospace and defense applications, Excelitas Technologies is committed to enabling our customers' success in their specialty end-markets. Excelitas Technologies has approximately 3,000 employees in North America, Europe and Asia, serving customers across the world.

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